

IN THE CLAIMS

Claim 1 (Currently Amended): An image encoding apparatus comprising:

conversion means for converting coding target blocks within a coding target image into conversion information, the conversion information being atom information of the coding target image;

quantization means for quantizing the conversion information and generating quantized conversion information; and

encoding means for generating compression data by encoding the quantized conversion information based on a plurality of sizes of blocks, and for generating a compression code used to generate the compression data for each block size, wherein

the encoding means adopts ~~the block size and~~ a compression code having a minimum bit rate among the plurality of generated compression codes over all of the plurality of block sizes, determines the block size which corresponds to the compression code having the minimum bit rate, and includes the block size and compression code corresponding to the ~~lowest~~ minimum bit rate in a header information.

Claim 2 (Previously Presented): An image encoding apparatus according to claim 1, further comprising dictionary storage means for storing a plurality of bases, wherein

the conversion means converts the coding target image into the conversion information including index information for specifying a basis used for decomposition of the coding target image among the plurality of bases, a coefficient by which the basis specified by the index information is multiplied, and positional information for specifying a position where a pattern made by multiplying the basis specified by the index information by the coefficient is restored, based on a predetermined conversion rule,

the encoding means generates the compression data including the compression codes based on a predetermined compression encoding rule, and

for each block size, the encoding means executes processing in which the encoding means divides the coding target image into the plurality of blocks, extracts, for each of the plurality of blocks, the quantized conversion information the positional information of which is included in the block, encodes, for each of the plurality of blocks, a flag for specifying existence of the quantized conversion information the positional information of which is included in the block, encodes, for each of the plurality of blocks, the number of items of quantized conversion information each of which includes the positional information included in the block, converts the positional information of the quantized conversion information into inter-block positional information specifying a relative position in the block in which the positional information is included, and encodes the quantized conversion information.

Claim 3 (Currently Amended): An image encoding method including:

converting coding target blocks within a coding target image into conversion information, the conversion information being atom information of the coding target image;

quantizing the conversion information and generating quantized conversion information;

generating compression data by encoding the quantized conversion information based on a plurality of sizes of blocks, and generating a compression code used to generate the compression data for each block size;

adopting ~~the block size and~~ a compression code having a minimum bit rate among the plurality of generated compression codes over all of the plurality of block sizes;

determining the block size which corresponds to the compression code having the minimum bit rate; and

including in header information the block size and compression code corresponding to the ~~lowest~~ minimum bit rate.

Claim 4 (Previously Presented): An image encoding method according to claim 3, wherein,

the conversion step further includes converting the coding target image, based on a predetermined conversion rule, into the conversion information including index information for specifying a basis used for decomposition of the coding target image among a plurality of bases stored in dictionary storage means, a coefficient by which the basis specified by the index information is multiplied, and positional information for specifying a position where a pattern made by multiplying the basis specified by the index information by the coefficient is restored,

the encoding step further includes generating the compression data based on a predetermined compression encoding rule, and

for each block size, dividing the coding target image into the plurality of blocks, extracting, for each of the plurality of blocks, the quantized conversion information the positional information of which is included in the block, encoding, for each of the plurality of blocks, a flag for specifying existence of the quantized conversion information the positional information of which is included in the block, encoding, for each of the plurality of blocks, the number of items of quantized conversion information each of which includes the positional information included in the block, converting the positional information of the quantized conversion information into inter-block positional information specifying a relative position in the block in which the positional information is included, and encoding the quantized conversion information.

Claim 5 (Previously Presented): An image encoding method according to claim 4, wherein

the quantization step further includes quantizing the coefficient included in the conversion information to generate the quantized conversion information including a quantized coefficient,

when encoding the quantized conversion information includes extracting a minimum absolute value among absolute values of the quantized coefficients included in a plurality of items of quantized conversion information, determining a code relating to the minimum absolute value in the compression data, converting each of the quantized coefficients into a differential value between the absolute value for each of the quantized coefficients and the minimum absolute value, including the differential values in the compression code after encoding, and including a positive or negative sign for each of the quantized coefficients in the compression code after encoding.

Claim 6 (Previously Presented): An image encoding method according to claim 4, wherein, the encoding step further comprises using arithmetic coding as the predetermined compression encoding rule and executing the arithmetic coding by using predetermined probabilities stored in a table having different values according to the size of the block.

Claim 7 (Currently Amended): A computer readable medium encoded with computer executable instructions for encoding an image, said set of computer executable instructions causing the computer to perform steps, comprising:

converting coding target blocks within a coding target image into conversion information, the conversion information being atom information of the coding target image;

quantizing the conversion information and generating quantized conversion information;

generating compression data by encoding the quantized conversion information based on a plurality of sizes of blocks, and generating a compression code used to generate the compression data for each size;

the encoding step further comprises encoding the quantized conversion information based on a plurality of sizes of the blocks, and generating the compression code corresponding to each size of the blocks;

adopting ~~the block size and~~ a compression code having a minimum bit rate among the plurality of generated compression codes over all of the plurality of block sizes;

determining the block size which corresponds to the compression code having the minimum bit rate; and

including in header information the block size and compression code corresponding to the ~~lowest~~ minimum bit rate.

Claim 8 (Currently Amended): An image decoding apparatus comprising:

decoding means for decoding block size information included in a header, and for generating quantized conversion information by decoding compression data, including a compression code included in the header corresponding to the block size used to divide a decoding target image, based on the decoded block size information;

inverse quantization means for inversely quantizing the quantized conversion information and generating conversion information, the conversion information being atom information of the decoding target image; and

inverse conversion means for inversely converting the conversion information into the decoding target blocks within a decoding target image,

wherein the compression code and the block size included in the header are determined by an image encoding apparatus, which performs encoding of quantized conversion information based on a plurality of sizes of blocks such that compression data is generated for each block size, and which determines that the compression code having a minimum bit rate among the plurality of generated compression codes over all of the plurality of block sizes is to be included in the header, and the block size which corresponds to the compression code having the minimum bit rate is to be included in the header.

Claim 9 (Previously Presented): An image decoding apparatus according to claim 8, further comprising:

dictionary storage means for storing a plurality of bases, wherein

the decoding means decodes the compression data including the compression code made by encoding the quantized conversion information, based on a predetermined decoding rule, the quantized conversion information being made by quantizing the conversion information which is made by conversing the decoding target image, based on a predetermined conversion rule, into index information to a basis used for decomposition of the decoding target image among the plurality of bases, a coefficient by which the basis specified by the index information is multiplied, and positional information for specifying a position where a pattern made by multiplying the basis specified by the index information by the coefficient is restored,

the inverse conversion means generates the decoding target image from the conversion information by using the plurality of bases stored in the dictionary storage means, based on a predetermined inverse conversion rule,

the positional information included in the conversion information is made to be inter-block positional information specifying a relative position in the block in which the positional information is included, and

the decoding means refers to the code relating to the size of the block included in the compression data and converts the inter-block positional information included in the conversion information into the positional information specifying a position in the decoding target image.

Claim 10 (Currently Amended): An image decoding method including:

decoding block size information included in a header, and generating quantized conversion information by decoding compression data, including a compression code included in the header corresponding to the block size used to divide a decoding target image, based on the decoded block size;

inversely quantizing the quantized conversion information and generating conversion information the conversion information being atom information of the decoding target image; and

inversely converting the conversion information into a decoding target block within the decoding target image,

wherein the compression code and the block size included in the header are determined by an image encoding apparatus, which performs encoding of quantized conversion information based on a plurality of sizes of blocks such that compression data is generated for each block size, and which determines that the compression code having a minimum bit rate among the plurality of generated compression codes over all of the plurality of block sizes is to be included in the header, and the block size which corresponds to the compression code having the minimum bit rate is to be included in the header.

Claim 11 (Previously Presented): An image decoding method according to claim 10, wherein,

the decoding step further comprises decoding compression data including the compression code made by encoding the quantized conversion information, based on a predetermined decoding rule, the quantized conversion information being made by quantizing the conversion information which is made by conversing the decoding target image, based on a predetermined conversion rule, into index information to a basis used for decomposition of the decoding target image among a plurality of bases, a coefficient by which the basis specified by the index information is multiplied, and positional information for specifying a position where a pattern made by multiplying the basis specified by the index information by the coefficient is restored,

the inverse conversion step further comprises generating the decoding target image from the conversion information by using the plurality of bases stored in dictionary storage means, based on a predetermined inverse conversion rule,

the positional information included in the conversion information is made to be inter-block positional information specifying a relative position in the block in which the positional information is included, and

the decoding step further comprises referring to the code relating to the size of the block included in the compression data and converting the inter-block positional information included in the conversion information into the positional information specifying a position in the decoding target image.

Claim 12 (Previously Presented): An image decoding method according to claim 11, wherein



the quantized conversion information includes a quantized coefficient being made by quantizing the coefficient,

the compression data includes the compression code made by encoding a code relating to a minimum absolute value among absolute values of the quantized coefficients included in a plurality of items of quantized conversion information, differential values between the absolute values of the quantized coefficients and the minimum absolute value, and a positive or negative sign of the quantized coefficients, and

the decoding step further comprises adding the minimum absolute value to each of the differential values included in the plurality of items of quantized conversion information generated by decoding the compression data with reference to a code relating to the minimum absolute value, and giving the positive or negative sign included in the quantized conversion information to an added value.

Claim 13 (Previously Presented): An image decoding method according to Claim 11, wherein

the compression code included in the compression data is generated by encoding with arithmetic coding according to predetermined probabilities stored in a table having different values according to the size of the block used as a predetermined compression encoding rule, and

the decoding step further comprises executing inverse arithmetic coding based on the predetermined decoding rule by using the predetermined probability table according to the size of blocks into which the decoding target image is divided.

Claim 14 (Currently Amended): A computer readable medium encoded with computer executable instructions for decoding an image, said set of computer executable instructions causing the computer to perform steps, comprising:

decoding block size information included in a header, and generating quantized conversion information by decoding compression data, including a compression code included in the header corresponding to the block size used to divide a decoding target image, based on the decoded block size information;

inversely quantizing the quantized conversion information and generating conversion information the conversion information being atom information of the decoding target image;  
and

inversely converting the conversion information into the decoding target blocks within a decoding target image,

wherein the compression code and the block size included in the header are determined by an image encoding apparatus, which performs encoding of quantized conversion information based on a plurality of sizes of blocks such that compression data is generated for each block size, and which determines that the compression code having a minimum bit rate among the plurality of generated compression codes over all of the plurality of block sizes is to be included in the header, and the block size which corresponds to the compression code having the minimum bit rate is to be included in the header.